

**DATE:** March 24, 2006

**TO:** Region Engineers  
Region Delivery Engineers  
TSC Managers  
Resident/Project Engineers  
Region Construction Engineers

**FROM:** Larry E. Tibbits  
Chief Operations Officer

John S. Polasek, Director  
Bureau of Highway Development

**SUBJECT:** Bureau of Highway Instructional Memorandum 2006-04  
Qualification Procedure for Class B Culvert and Sewer Plastic Pipe

The Construction and Technology (C&T) Support Area has recently approved the *Qualification Procedure for Class B Plastic Pipe*.

The current *Standard Specifications for Construction* allow plastic pipe to be used in Class A and F culvert installations and Class A storm sewer installations. With the recent implementation of the *American Association of State Highway and Transportation Officials LRFD Bridge Design Specifications*, deeper bury depths for plastic pipe may be allowed. Section 12 of the *LRFD Specifications* presents equations that are based on the geometry of the corrugations or profile of the pipe wall. Each plastic pipe manufacturer produces pipe with different proprietary geometries and thereby must be individually evaluated.

This qualification procedure is for plastic pipe manufacturers who want to have 12-inch to 24-inch diameter pipe evaluated for addition to the *Class B Plastic Pipe* Qualified Products List (QPL). The evaluation will be based on pipe design calculations prepared in accordance with Section 12 of the *LRFD Specifications*. Pipe must already be listed on the QPL for *Watertight Joint Systems for Sewers and Culverts* in order to be considered for review under the *Qualification Procedure for Class B Plastic Pipe*.

Two new Frequently Used Special Provisions, *Culvert Classes Table 401-1* and *Storm Sewer Classes Table 402-1*, will be included in proposals when either generic pipe material or specific plastic pipe material are specified for 24-inch diameter and smaller Class B culvert and sewer installations.

**When these Frequently Used Special Provisions are found in the proposal, contractors and inspectors need to refer to the QPL for *Class B Plastic Pipe* for approved manufacturers and diameters.**

This qualification procedure and the QPL for *Class B Plastic Pipe* apply only to Class B culverts and sewers, and do not affect Class A or F culverts or Class A sewers.

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Chief Operations Officer

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Director, Bureau of Highway Development

Attachment

BOHD:Design:PGF

cc: C & T Support Area Staff  
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**Qualification Procedure  
For  
Class B Plastic Pipe**

1. Scope

- 1.1 This document describes the procedure to be followed by plastic pipe manufacturers who wish to have 12-inch to 24-inch diameter sewer and culvert pipe evaluated for addition to the Qualified Products List (QPL) for Class B installations for a qualification period of five years.

2. Submittal Procedure

- 2.1 Request for Product Design Calculations Review – A written request for product design calculations review must be submitted to the following address:

Flexible Pipe Specialist  
Municipal Utilities Unit  
Utilities, Drainage & Roadside Section  
Design Support Area  
425 W. Ottawa  
Lansing, MI 48933  
Telephone: (517) 373-7596

- 2.2 Product Information – Include all material specifications and design drawings including pipe geometry. Provide approved third party verification for the idealized wall profile geometry for each diameter of pipe. **Pipe must already be listed on the QPL for *Watertight Joint Systems for Sewers and Culverts* in order to be considered for review under this qualification procedure.**
- 2.3 Load-and-Resistance Factor Design (LRFD) Calculations – Include product design calculations prepared in accordance with Section 12 of the current *American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications*. Demonstrate, through the calculations, adequate strength and service for depths of cover from 10- to 16-feet. Assumed values for factors and other parameters shall be conservative and indicative of a typical embankment installation in Michigan. Provide an explanation for the selection of factors and parameters if they differ from the values listed below. Submit calculations in either Microsoft Excel or Mathsoft Mathcad format.
- 2.4 Factor and Parameter Values – Use the following factors and parameters in the Section 12 equations. Follow the LRFD specifications and commentary for factors and parameters not listed below.

$\gamma_{EV}$	= 1.95	Load Factor for permanent load
$\gamma_{LL}$	= 1.75	Load Factor for vehicular live load
$\gamma_{WA}$	= 1.3	Load Factor for hydrostatic pressure
$\Phi$	= 1.00	Resistance Factor for flexure and minimum wall area and buckling
$\Phi_s$	= 0.90	Resistance Factor for soil stiffness
$\eta_{EV}$	= 1.0	Load Modifier applied to vertical earth loads
$P_{SP}$	= 0.120 kcf	Geostatic earth pressure
$h_w$	= 8.0 feet	Height of water surface above top of pipe
$\gamma_w$	= 0.0624 kcf	Unit weight of water
$\Delta$	= 5%	Allowable deflection of pipe
Soil type		Sn
90%		Degree of Compaction - standard Proctor backfill density (MDOT follows the suggested practice of the AASHTO LRFD Bridge Specification's Commentary to design for a standard Proctor backfill density 5 percent less than specified by the contract documents.)

### 3. Evaluation

- 3.1 The submitted calculations will be reviewed for conformance with Section 12 of the current *AASHTO LRFD Bridge Design Specifications*.

### 4. Disqualification

- 4.1 A product may be immediately removed from the QPL should any problems develop related to installation or performance. A product may also be removed due to specification changes made by either MDOT or the product manufacturer. Removal from the QPL will result in immediate loss of approved status on all active and proposed projects. If a product is removed from the QPL, it will not be approved for use on a state or federally-funded project until the manufacturer has demonstrated, to the satisfaction of the Municipal Utilities Unit, the material has been redesigned and shown to meet all applicable specifications and requirements.

### 5. Requalification

- 5.1 A product that has been disqualified and removed from the QPL will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**CULVERT CLASSES TABLE 401-1**

DES:PGF

1 of 1

C&T:APPR:RDT:DBP:02-22-06  
FHWA:APPR:03-01-06

**Delete Table 401-1, Pipe Alternates for Culvert Classes, on page 184 of the Standard Specifications for Construction, and replace with the following:**

**Table 401-1 Pipe Alternates for Culvert Classes**

Type of Pipe Depth of Cover in feet (a)	Class A Culvert 0 to 10 (l)	Class B Culvert >10 to 16	Class C Culvert >16 to 23	Class D Culvert >23 to 33 (i)	Class E Culvert 0 to 3 (b)	Class F Drive Culvert (c)
Reinforced Concrete Pipe (d)	II	III	IV	V	IV	II
Nonreinforced Concrete Pipe (e)	1	3	No	No	No	1,3 (f)
Corrugated and Spiral Ribbed Al-Alloy Pipe (j)	Yes	Yes	Yes	Yes	No	Yes
Corrugated and Spiral Ribbed Steel Pipe (j)	Yes	Yes	Yes	Yes	No	Yes
Smooth-Lined Corrugated Plastic Pipe (CPE) (g)(j)	Yes (h)	Yes (k)	No	No	No	Yes (h)

- a. Cover, including the pavement structure is defined as the height of fill above the top of the pipe.  
b. Class E culvert applies when the culvert is beneath the influence of proposed pavement and the depth of cover is 3 feet or less.  
c. Class F culvert applies for driveway culverts (residential and commercial).  
d. Roman numerals refer to class of reinforced concrete pipe, AASHTO M 170.  
e. Arabic numerals refer to the class of nonreinforced concrete pipe, AASHTO M 86.  
f. Nonreinforced concrete pipe Class 1 is allowed for Class F culverts with a depth of cover up to 10 feet. Nonreinforced concrete pipe Class 3 is allowed for Class F culverts with a depth of cover greater than 10 feet, but less than or equal to 16 feet.  
g. CPE must conform to AASHTO M 294, Type S polyethylene pipe.  
h. Permitted only for 36-inch diameter pipe and under for CPE pipes.  
i. Special design is required for depths of cover greater than 33 feet.  
j. Minimum cover 2 feet when the culvert is outside the influence of proposed pavement (measured from top of pipe to final grade).  
k. Permitted only for 12 to 24-inch diameter CPE pipes. Refer to the Class B Plastic Pipe Qualified Products List for approved manufacturers and products.  
l. Class A culvert applies when the culvert is outside the influence of proposed pavement or is beneath the influence of proposed pavement and the depth of cover is greater than 3 feet, but less than or equal to 10 feet.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**STORM SEWER CLASSES TABLE 402-1**

DES:PGF

1 of 1

C&amp;T:APPR:RDT:DBP:02-22-06

FHWA:APPR:03-01-06

**Delete Table 402-1, Pipe Alternates for Storm Sewer Classes, on page 196 of the Standard Specifications for Construction, and replace with the following:**

**Table 402-1 Pipe Alternates for Storm Sewer Classes**

Type of Pipe Depth of Cover in feet (a)	Class A Sewer 0 to 10 (l)	Class B Sewer >10 to 16	Class C Sewer >16 to 23	Class D Sewer >23 to 33 (m)	Class E Sewer 0 to 3 (b)
Reinforced Concrete Pipe (c)	II	III	IV	V	IV
Nonreinforced Concrete Pipe (d)	1	3	No	No	No
Corrugated and Spiral Ribbed Al-Alloy Pipe (e)	Yes	Yes	Yes	Yes	No
Corrugated and Spiral Ribbed Steel Pipe (f) (k)	Yes	Yes	Yes	Yes	No
Smooth-Lined Corrugated Plastic Pipe (CPE) (g)	Yes (h)	Yes (i)	No	No	No
Corrugated Polyvinyl Chloride Pipe (CPV) (j)	Yes (h)	Yes (i)	No	No	No

- a. Cover, including the pavement structure is defined as the height of fill above the top of the pipe.  
b. Class E sewer applies when the sewer is beneath the influence of proposed pavement and the depth of cover is 3 feet or less (measured from top of pipe to final grade).  
c. Roman numerals refer to class of reinforced concrete pipe, AASHTO M 170.  
d. Arabic numerals refer to the class of nonreinforced concrete pipe, AASHTO M 86.  
e. Permitted for 12 to 66-inch spiral ribbed and 12 to 18-inch helically corrugated 2 2/3 x 1/2-inch aluminum alloy pipe only. Minimum cover 3 feet (measured from top of pipe to final grade).  
f. Permitted for 12 to 84-inch spiral ribbed and 12 to 18-inch helically corrugated 2 2/3 x 1/2-inch steel pipe only. Minimum cover 3 feet (measured from top of pipe to final grade).  
g. CPE must conform to AASHTO M 294, Type S polyethylene pipe.  
h. Permitted only for 36-inch diameter pipe and under for CPE and CPV pipes. Minimum cover 3 feet (measured from top of pipe to final grade).  
i. Permitted only for 12 to 24-inch diameter CPE and CPV pipes. Refer to the Class B Plastic Pipe Qualified Products List for approved manufacturers and products.  
j. CPV must conform to AASHTO M 304.  
k. Refer to Frequently Used Special Provision 03SP402(A).  
l. Class A sewer applies when the sewer is outside the influence of proposed pavement or is beneath the influence of proposed pavement and the depth of cover is greater than 3 feet, but less than or equal to 10 feet.  
m. Special design is required for depths of cover greater than 33 feet.